

between the supply of technical education in this country and in Germany was made in a valuable article which appeared in the issue of that journal of November 9.

Most of the English technical schools have, says the writer in the *Times*, for their principal object the teaching of actual industries. In Germany, on the other hand, the term has come to be associated more and more with pure knowledge, and is now commonly reserved for those advanced academies which teach the science underlying industries, but not the industries themselves. What we generally call technical schools are in Germany called "Fachschulen," or Gewerbeschulen, that is, "trade schools," which fall into two main groups. The first group provides instruction for apprentices in the hand trades and for artisans, and may be called "lower trade schools." The second group is large and of great direct importance to the manufacturing industries. The "technical schools" in our large manufacturing towns correspond most nearly to these institutions, which may be called "higher trade schools." Then above these is the highest class, namely, the "technical high schools," which do not correspond to any of our educational institutions. This classification gives a clear view of the special educational provision for industrial life in three broad divisions:—(1) ordinary workmen; (2) those above the grade of workmen from foremen to manufacturers; (3) the high scientific experts, consultants, and innovators.

The main differences between the higher trade schools and the corresponding English technical schools are two—they are more specialised, and are chiefly intended for and used by superior students. There is some provision for workmen, but, as a rule, comparatively little advantage is taken of it. The classes proper are held in the day, and cannot be attended by men at work; those thronged evening lecture-rooms and laboratories filled with young fellows out of the factories and workshops which may be seen in any large manufacturing town in England are almost unknown in Germany. The real meaning of this is that the English schools cater for students in a lower rank of life and teach a much larger number of subjects. The German schools of this class, on the contrary, are quite clearly differentiated. They are not quite so restricted as the description applied to them suggests. The "weaving" schools, for instance, generally embrace all the main textile processes. But they are strictly devoted to some special branch of industry, and their main function is to enable students, who are to occupy superior positions, to acquire a thorough mastery of the skilled processes. Our own textile schools do excellent work, and, so far as affording opportunities to the working classes is concerned, they do far more than the German ones, but they do not command the same superior material. The reason for this is that there is not yet the same inducement to young men who have had a superior liberal education to take up the career of manufacturers' expert. This fact is really at the bottom of the question of scientific education. Given the demand, the supply will follow. The lesson to be learnt from Germany is to make industrial science a sufficiently attractive career for those who have received a superior general education, and particularly a full classical one. The Germans have no belief in the American plan of teaching trades wholly in schools. With regard to finances, these schools are supported by fees, endowments, municipal and State grants, but the general tendency is towards more and more State support and State control.

The technical high schools, of which there are nine, with two more in preparation, represent a further step. As the superior grade of trade schools has been developed from a lower, so the high schools have been developed from trade schools to meet still higher requirements. They have the *status* of universities, are self-governing, and do for the industrial professions what the universities do for the learned professions—that is, impart the highest training in those principles which form the theoretical groundwork of practice. The technical high schools do not supersede or overlap the universities: they supplement them.

The technical high schools have no uniform curriculum, but all of them teach architecture, civil and mechanical engineering, chemistry, mathematics, and physical science. Exceptional subjects are naval architecture (Berlin), mining

(Aachen), forestry (Stuttgart), agriculture (Munich). Pharmacy is taught at Brunswick, Karlsruhe, and Stuttgart, and at the last there is a railway, post, and telegraph course. Previous practical knowledge is generally required, as in the trade schools, and more rigidly insisted on. The high school is even less than the trade school a substitute for apprenticeship.

The two really important departments of the technical high schools are chemistry and electrical engineering. It is impossible to exaggerate the importance of the first; it enters into every branch of manufacture, and becomes more potent every day. At the high school teaching and experiment are pushed to the furthest theoretical limits, and the value to Germany is incalculable. Her chemical industries are reckoned to bring in fifty millions a year, but the application of chemical knowledge goes far beyond that and extends into a thousand channels. Nor can any man tell what it may bring forth to-morrow. This is the great lesson in industrial science that the high school has to teach. But it must not be forgotten that chemistry can be, and is, equally well taught at the universities. So, too, electrical engineering, which has also been of immense value to Germany; but her rapid industrial advance in that line, compared with ourselves, is due less to superior knowledge than to the gratuitous retardation of the home industry by Government regulations.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, December 11.—Mr. James Swinburne, vice-president, in the chair.—A method of mechanically reinforcing sounds, by the Rev. T. C. Porter. If a tuning-fork be sounded and placed in a flame, there is a very marked reinforcement of the sound. This is proved not to be due to resonance in the ordinary sense, but to the change from continuous to intermittent combustion. In certain circumstances the impulses given to the air external to the flame, by the waves of burning gas, are more forcible than those given by the unaided sounding body. Thus a new way of reinforcing the sounds given by a vibrating body is found, and the rest of the paper demonstrates this for the phonograph, a flame being used instead of the ordinary trumpet. Coal-gas and air are brought by tubes into the chamber of the "reproducer" and thence to a jet, where they are burnt. The vibrations of the reproducer are thus impressed on the issuing gas and air, which burn synchronously with them, the sounds thus emitted being easily heard over a large room. In practice it is found best to spread out the flame by a second jet of air, or of mixed air and gas, placed close to the first jet and at right angles to it. The author describes the nature and quality of the sounds emitted by the flame, and the modifications of these which may be produced.—The Simmance-Abady "flicker" photometer, by Messrs. Simmance and Abady. The principle of the flicker photometer, discovered by Prof. O. N. Rood ten years ago, has frequently been remarked on, but attempts to design a trustworthy apparatus depending upon this principle have hitherto been unsuccessful. The authors, guided by the following rules, have designed a photometer which is capable of balancing and comparing the most violently contrasted tints:—The light-effects must be in juxtaposition without any apparent division line, and must move, oscillate, or rotate so that the point of juncture of the rays of the two lights passes and returns entirely across the vision field. Any hiatus, or longer exhibition of one light than the other, biases the result. The observation surfaces, or surfaces upon which the light rays fall, must be at exactly the same distance from the eye, at exactly the same angle in relation to the line of sight, and must be of pure white, such as is afforded, for example, by a clean chalk, plaster of Paris, magnesium carbonate, or barium sulphate; any tint affects the accuracy of the result. The observation surfaces must also themselves in turn occupy the field of vision; an apparent movement or optical illusion does not afford accurate results.—Mr. Rollo Appleyard exhibited a "conductometer" the theory and mechanical details of which are fully described in the *Proceedings* of the Institution of Civil Engineers, vol. cliv., session 1902-3, part iv.—Prof. L. R. Wilberforce exhibited

a model to illustrate various properties of wave-motion. The model consists of a series of brass balls suspended in a line by spiral springs and capable of transverse or up and down motion. The balls can be set in vibration by releasing them from extreme positions by means of triggers, one set of triggers controlling the up and down motion, and another set the pendular.

Chemical Society, December 3.—Prof. W. A. Tilden, F.R.S., president, in the chair.—The molecular formulæ of some fused salts as determined by their molecular surface energy, by Mr. J. F. **Bottomley**. Measurements of the variation of capillary rise of fused sodium and potassium nitrates with temperature have shown that these salts probably exist in a fused state in the form of complex molecules containing nine or ten of the molecules represented by the simple formulæ NaNO_3 and KNO_3 .—The atmospheric corrosion of zinc, by Mr. G. T. **Moody**. It is shown that the semi-crystalline scale formed on the surface of the metal when zinc is exposed to the atmosphere consists of a hydrated carbonate. The same compound is formed when zinc is dissolved in a solution of carbon dioxide and the resulting solution is exposed to the air. From these experiments the author concludes that carbon dioxide is the principal agent in the atmospheric corrosion of zinc, as he has already shown it to be in the case of iron.—The formation of urea by the direct hydrolysis of lead cyanate, by Mr. A. C. **Cumming**. When lead cyanate is boiled with water it is decomposed with the formation of urea and lead carbonate.—Acid salts of monobasic acids, by Mr. R. C. **Farmer**. An account of the physical properties of some acid salts of benzoic acid and their derivatives is given.—The solubility curves of the hydrates of nickel sulphate, by Messrs. B. D. **Steele** and F. M. G. **Johnson**. Solubility curves are given for the heptahydrate, α - and β -hexahydrates, and for the dihydrate.—Action of malt diastase on potato starch paste, by Messrs. B. F. **Davis** and A. R. **Ling**. When malt diastase is heated in aqueous solution at temperatures in the neighbourhood of 60°C . its action upon starch paste is weakened, and dextroglucose appears among the products of hydrolysis.—The formation of phloroglucinol by the interaction of ethyl malonate with its sodium derivative, by Mr. C. W. **Moore**. It is shown that the condensation product formed in this reaction is ethyl phloroglucinoldicarboxylate, and not the tricarboxylate as stated by von Baeyer.

Mathematical Society, December 10.—Prof. H. Lamb, president, in the chair.—The following papers were communicated:—Mr. R. J. **Dallas**, Proof of a formula in elliptic functions.—Dr. E. W. **Hobson**, On modes of convergence of an infinite series of functions of a real variable. The condition of uniformity of convergence is known to be sufficient to secure the continuity of the function expressed by the sum of an infinite series the terms of which are continuous functions, but the function may be continuous without the convergence being uniform. The necessary and sufficient conditions have recently been made out, and new proofs of them are given in the paper. Another matter discussed is the nature of the conditions which are necessary and sufficient to secure that, when the terms of the series are integrable without being continuous, the function expressed by the sum of the series is integrable. The methods of proof depend upon applications of the Heine-Borel theorem in the theory of aggregates.—Mr. W. H. **Young**, On the distribution of the points of uniform convergence of a series of functions. It is proved that the points in question form an "inner limiting set," and that, conversely, given any such set of points, a series of functions can be constructed having these points, and these points only, as points of uniform convergence.—Rev. F. H. **Jackson**, A generalisation of Neumann's expansion of an arbitrary function in a series of Bessel's functions.—Prof. A. C. **Dixon**, On many-valued Newtonian potentials. The paper deals with a theory on the lines of Riemann's theory of the Abelian functions, but relating to space of three dimensions. The various values of the potential function become different one-valued functions in a bounded simply-connected region, and these various values must be supposed to exist in different co-extensive examples of this region. The chief question is that of the existence of a potential one-valued throughout all the coextensive examples of the region, and having a

simple pole at an assigned point in a particular example. Two values of a many-valued potential, which are permuted by description of an irreducible circuit, may differ by a constant or by a variable function.—Mr. P. E. B. **Jourdain**, On functions all of whose singularities are non-essential.—Prof. J. D. **Everett**, On normal and anti-normal piling. The object of the paper is to exemplify a convenient method of dealing with systematic assemblages of points. Normal piling denotes a particular homogeneous assemblage, whereas the arrangement in anti-normal piling is made up of two homogeneous assemblages. Both arrangements give the maximum of compactness.—Lieut.-Colonel Allan **Cunningham** made a preliminary communication on some properties of Fermat's numbers. If $F_n = 2^{2^n} + 1$ and P is a product of F's, the smallest suffix (a) exceeding unity and the highest not exceeding $2^a - 1$, then $2^{2^a} \equiv 1 \pmod{P}$ and $2^{2^{a-1}} \equiv 1 \pmod{P^2}$.

Entomological Society, November 18.—Prof. E. B. Poulton, F.R.S., president, in the chair.—Mr. G. C. **Champion** exhibited numerous specimens of both sexes of *Xyleborus dispar*, from Moncayo, Spain, taken out of beech-stumps.—Mr. F. B. **Jennings** exhibited (1) on behalf of Mr. H. Britten, of Great Salkeld, Cumberland, a specimen of *Tropiphorus tomentosus*, Marsh., from Great Salkeld, showing the deciduous false mandibles intact; (2) a ♀ specimen of *Anchomenus parumpunctatus*, F., from the same locality, showing a malformation of the middle right tibia which was abnormally thin, and bent in the centre, but thickened at the base; the right antenna also had the last seven joints flattened and dilated. Mr. Jennings also exhibited, on his own behalf, *Apion sanguineum*, De G., taken at Brandon, Suffolk, in August last, on Rumex.—Mr. H. St. J. K. **Donisthorpe** exhibited *Apium sorbi*, ♂, taken this year at Freshwater, Isle of Wight, and said that the ♂ of this species was extremely rare.—Mr. M. **Burr** exhibited two ♀s and two ♂s of the largest known earwig, *Anisobolus colosseus*, Dohrn., from New South Wales, representing the extremes of size, the average size being between these two extremes.—Mr. A. J. **Chitty** exhibited a specimen of the beetle *Homalium testaceum*, taken in Blean Wood in 1900, and a pair of bees, *Nomada guttulata*, of which the ♂ has never been recorded hitherto in Britain, taken by him at Huntingford, Kent, in May last.—Dr. Norman **Joy** exhibited (1) *Euconnus mäklini*, Mannerh., taken at Bradfield in July, 1901, new to the British list of Coleoptera; and (2) a series of beetles taken at Bradfield at the exuding sap of trees attacked by *Cossus ligniperda*.—Colonel J. W. **Yerbury** exhibited specimens of rare British Diptera, including *Leptopa filiformis*, Lett., *Thyreophora furcata*, *Pelidnoptera nigripennis*, and *Lucina fasciata*.—Dr. T. A. **Chapman** exhibited specimens of *Chrysophanus phlaeas* captured at Reigate, Locarno, and in Spain, showing the apparent effects of temperature on the coloration and wing markings.—Mr. G. J. **Arrow** showed specimens and diagrams illustrating a remarkable kind of variability noticed in beetles of the Trogid genus *Acanthocerus*. These beetles have the faculty of rolling themselves into a ball, in the interior of which all the vulnerable parts are enclosed. The head forms a large triangular plate in which the eyes appear half on the upper and half on the lower surface. In some examples of the species exhibited (*Acanthocerus relucens*, Bates) the upper division of the eyes forms a large, nearly circular mass, while in others it is reduced to a mere thin vestige, and in extreme examples of another species of the genus it was found to vanish altogether.—Prof. **Poulton** showed an exhibit sent by Mr. A. H. Thayer, of Monadnock, N.H., U.S.A. The greyish silhouettes of two butterflies were represented in a tint nearly the same as the background, but sufficiently distinct to be easily recognisable. On one side of one silhouette a row of white spots had been placed in a sub-marginal position. It was evident that the adjacent border was thereby rendered far less distinct than that of the opposite side of the silhouette, or of both sides of the other silhouette. The spots in position and shape were approximately as in *Papilio asterias*, and Mr. Thayer considered they possessed a similar significance in this butterfly. Prof. Poulton also exhibited specimens of *Drurya antimachus*, together with the butterflies which he suggested as forming a group synaposematic with it. The central species

appeared to be *Acraea egina*, round which clustered a number of other species of the same genus, so much alike as to be probably indistinguishable upon the wing. Examples of these were exhibited, viz. *A. zetis*, *perenna*, *rogersi*, and *pharsalus*. Another beautiful papilionian member of the group, *P. ridleyanus*, was also shown. The pattern was nearest to that of the male *A. egina*. In fact, so close was the resemblance that Godart had been entirely misled by it, and had described the *Papilio* under the name of *zidora* as the female of *Acraea egina*.—Mr. Edward Saunders, F.R.S., communicated a supplementary note to a paper entitled "Hymenoptera Aculeata Collected by the Rev. A. E. Eaton, in Madeira and Tenerife, in the Spring of 1902."

Geological Society, November 18.—Sir Archibald Geikie, F.R.S., vice-president, in the chair.—Notes on some Upper Jurassic Ammonites, with special reference to specimens in the University Museum, Oxford, by Miss Maud Healey. In rearranging the Upper Jurassic fossils in this museum the prevailing misconception with regard to Sowerby's species *Ammonites plicatilis* and *Am. biplex* came under notice. The type-specimen of *Perisphinctes plicatilis* (Sow.) is refigured and described. It appears to be an Upper Corallian form, and is usually taken as the zone-fossil of that horizon. Sowerby's two figures of *Perisphinctes biplex* represent different specimens. One, probably from a Kimmeridge Clay nodule found in the Suffolk Drift, is refigured and described. It would be wisest, the paper suggests, to abandon the name, or at least to restrict it to the abnormal specimen to which it was attached. The original specimen of *Perisphinctes variocostatus* (Buckland) came from the so-called Oxford Clay at Hawnes, but evidence that it was really derived from the Amptill Clay was given. Sowerby's *Ammonites rotundus* is doubtfully identified as a variety of *Olcostephanus Pallasianus* (d'Orb.). It was derived from the Kimmeridge Clay of Chippinghurst, and is the zone-fossil of the Upper Kimmeridge Clay.—On the occurrence of *Edestus* in the Coal-measures of Britain, by Mr. E. T. Newton, F.R.S. This genus was originally described from the United States, and was afterwards recognised in Russia and Australia. The genus was placed with *Helicoprion* and *Campyloprion* in the family *Edestidae*. The specimen here described was obtained by Mr. J. Pringle from one of the marine bands between the "Twist Coal" and the "Gin-Mine Coal," in the Smallthorn sinking at Nettlebank (north Staffordshire). The specimen is a single segment of a fossil closely resembling *Edestus minor*, and consists of an elongated basal portion, bearing at one extremity a smoothed, enamelled, and serrated crown. The fossil is not to be referred to any existing species, and a new name is given to it. While it seems most in accordance with present knowledge to regard the "spiral saw" of *Helicoprion* as the symphyseal dentition of an Elasmobranch, possibly allied to the Cestracionts, it does not seem so probable that the forms referred to *Edestus* are of the same nature. The author thinks the latter are more likely to be dorsal defences.

Zoological Society, November 17.—H.G. the Duke of Bedford, K.G., president, in the chair.—Mr. Henry Schorren exhibited and made some remarks on the largest horn of *Rhinoceros simus* yet obtained from the Soudan. He directed attention to the fact that the species appeared to be fairly numerous on the northern boundary of the Congo Free State and in the adjacent parts of the Soudan.—Mr. R. I. Pocock exhibited a piece of basalt, picked up on the coast of Victoria, Australia, which contained a web of the marine spider *Desis kenyonae*. This served to illustrate the habit of the spiders of the genus *Desis* of spinning a closely woven sheet of silk over a crevice in the rock as a protection against the rising tide.—Mr. Pocock also gave an exposition, illustrated by drawings, of a new suggestion as to the use of the white rump-patches of Ungulata, with special reference to the races of Burchell's zebra.—Mr. E. E. Austen exhibited and made remarks on specimens of *Glossina palpalis*, the species of tsetse-fly which is concerned in the transmission of "sleeping sickness" in the Uganda Protectorate. He also exhibited, for the sake of comparison, specimens of four other species of tsetse-flies, including *Glossina longipennis*, which occurs in Somaliland,

and may possibly prove destructive to the transport animals of the Somaliland Field Force.—Mr. Oldfield Thomas, F.R.S., exhibited, on behalf of Mr. W. E. de Winton, a drawing of a skin of a female gazelle—probably *Gazella muscatensis*—from Sheik Oman, near Aden, which showed a perfect hair-whorl on the withers. This whorl had been found to be absent in the male.—Mr. C. Tate Regan read a paper entitled "A Revision of the Fishes of the Family Loricariidae," in which nearly 200 species were recognised as valid, 35 being described as new to science.—Dr. Blandford read, on behalf of Mr. V. V. Ramanan, a communication entitled "Early Sanskrit References to the Tiger," in which it was pointed out that the tiger was frequently alluded to in Sanskrit literature, and that Colonel Stewart was in error in stating at a previous meeting that there was no Sanskrit name for this animal.—Mr. F. E. Beddard, F.R.S., read a paper on the trachea and lungs and other points in the anatomy of the hamadryad snake (*Ophiophagus bungarus*).—Mr. G. A. Boulenger, F.R.S., read a report on the fishes collected by Mr. Oscar Neumann and Baron Carlo von Erlanger in Gallaland and southern Ethiopia. Examples of 19 species, 4 of which were new, were contained in the collection, and these were enumerated and described.

Royal Meteorological Society, November 18.—Captain D. Wilson-Barker, president, in the chair.—Dr. H. R. Mill and Mr. R. G. K. Lempfert gave an elaborate and interesting paper on the great dustfall of February and its origin. From the maps exhibited it appears plain that the dust reported on February 21 or 22 fell over nearly all parts of England and Wales to the south of a line drawn from Anglesey to Ipswich, except in parts of north Cornwall, Somerset, Wilts, and mid-Wales. The dust usually attracted attention either in the form of a dense yellow haze, like a London fog, or as a reddish-yellow powder, lying thickly on trees and roofs. The fall was often accompanied by temperatures considerably above the average, and by remarkably low relative humidities. In order to ascertain whether the composition of the dust threw any light on its origin, about fifty samples were submitted to the Geological Survey and examined by Dr. J. S. Flett. In addition to the coarser particles, all the samples contained a very fine-grained reddish clay, the particles of which were too minute to be determined mineralogically. This clay was certainly derived from some source beyond the British Isles, but it was not distinctive enough to afford much evidence as to its place of origin. Maps have been constructed showing the distribution of the dust and the meteorological conditions prevailing over the period when it appeared. These form the basis of a discussion by Mr. Lempfert as to the place of origin and the direction of travel of the air which was passing over western Europe at the time in question. The trajectories of the air which reached the southern half of England can be traced backwards in a south-westerly direction to the neighbourhood of the Azores, but here it turns to the south, and finally to the south-east, and is carried back to the north-west coast of Africa on the morning of February 19. The authors are therefore of opinion that there is reason to believe that the air which reached the southern half of England on February 22 started from the north-west coast of Africa on February 19, and they consider this affords strong evidence of the African origin of the dust, and of its having travelled to north-west Europe by a path not very different from that indicated by the trajectories.

Linnean Society, December 3.—Prof. J. Bretland Farmer, F.R.S., vice-president, in the chair.—Dr. Eric Drabbe gave an account of his recent researches on the anatomy of the roots of palms, illustrated by lantern-slides from his drawings. He stated that the roots of more than sixty species have been examined. Essentially similar results have been obtained from each. It appears that the "medulla" in palm-roots is merely that portion of the common ground-parenchyma, arising at the non-stratified apex, which becomes enclosed distally by fusion of the procambial strands, and hence differs in no respect from the external "cortical" parenchyma. An attempt was made to extend this idea to other vascular plants, and the suggestion was put forward that all ideas of "monostely" and "polystely," and of "medulla" and "cortex" as

separate morphological entities, are based on an artificial conception of the structures involved.—In a paper by Dr. Arthur **Wiley**, F.R.S., an account was given of twenty-eight species of littoral Polychæte worms from South Africa, of which four are new. The specimens had been carefully prepared, and the author is satisfied with the results. He comes to the general conclusion that the annelid fauna of the Indo-Pacific region may be said to be composed of an assemblage of endemic, Caribbean, and Mediterranean constituents.—Notes on *Myriactis Areschougii* and *Coilodesme californica*, by Miss May **Rathbone**. The species of *Myriactis* in question is parasitic on *Himanthalia lorea*, forming very small tufts with a cushion of large torulose colourless cells, deeply sunk in the thallus of the host. Material was obtained from Cumbrae in March which shows penetrating rhizoids belonging to some parasitic alga; they start from the base of the cushion and travel far in the tissues of the host, and the conclusions of the author are that these rhizoids act as stolons for propagating the plant, which seems rather to be an endophyte than a parasite.

Anthropological Institute, December 8.—Mr. H. Balfour, president, in the chair.—The Rev. R. A. **Bullen** exhibited a series of polished and other slate implements from Harlyn Bay, Cornwall. The implements were found on the site of a late Celtic cemetery, the graves of which are lined with slate, buried some twelve feet beneath blown sand. Mr. Bullen was of opinion that the implements showed unmistakably the hand of man, but, in the discussion which followed, Mr. C. H. Read expressed his firm conviction that the implements had been worn, not by man, but by the sand which for centuries had been drifting continually over them. Most of the implements, he considered, were simply chippings from the slate linings of the graves, worn by the sand to their present shape.—Dr. William **Wright** read a paper on skulls from round barrows in east Yorkshire, the skulls in question being now in the Mortimer Museum at Driffield. About eighty of them were examined. The interments, from the evidence of the finds, appeared to date from the early Iron or late Stone age. As to the skulls themselves, Dr. Wright showed that almost every variety of cranial shape was found among them, such widely different types as Sergi's *Ellipsoides Pelasgicus Longissimus*, *Sphenoides Latius*, and *Cuboides Procerus* being present, while the cephalic index ranged from 69 to 92. In fact, so varied were the types that Dr. Wright felt that it was doubtful whether, in a community of the present day, it would be possible to find a more mixed series of skulls. A most interesting point was the extraordinary resemblance, in many cases, between the skulls from any one barrow, in fact it was so striking that Dr. Wright felt inclined to attribute it to the barrows having been family burial-grounds. The resemblance was particularly noticeable in nine skulls taken from one barrow. Four of these had the metopic suture unclosed, and it was interesting, and somewhat unexpected, to find that metopism occurred in long rather than in broad skulls. The conclusion drawn from Dr. Wright's paper was that Thurnam's dictum of "round barrow round skull" was not even approximately accurate so far as skulls from the round barrows in Yorkshire were concerned.

MANCHESTER

Literary and Philosophical Society, November 17.—Prof. H. B. Dixon in the chair.—Prof. **Lamb** exhibited and described two photographs, taken at the Isle of Man by Mr. Hiller, one of which showed very clearly the interference between the direct and reflected waves on the sea coast. The points of intersection of the two systems of waves were particularly well marked. Mr. T. **Thorpe** exhibited a small glass tube containing a little radium bromide at the sealed end, and terminating in a bulb at the other end. The whole formed a vacuum tube, and was a very convenient and portable instrument for showing the fluorescence of radium bromide on a barium platino-cyanide screen in the dark. He also stated that the bulb caused a charged electroscope to discharge very rapidly.—Messrs. R. S. **Hutton** and J. E. **Petavel** described some experimental work which they have undertaken with the view of studying the effect of high gaseous pressures upon

electric furnace reactions. The investigation is being carried out in the electrochemical laboratory of the Manchester University. The preliminary results only were given, progress having been necessarily slow up to the present. The several dispositions of the furnace and of the arcs were described, and photographs of them thrown upon the screen. To obtain satisfactory results it is necessary to exceed the laboratory scale of operations. For the present the work has been confined to the production of calcium carbide, aluminium and nitric acid as effected by pressures up to 150 atmospheres.

DUBLIN.

Royal Dublin Society, November 17.—Prof. W. F. Barrett, F.R.S., in the chair.—Sir Howard **Grubb**, F.R.S., read the following papers:—(1) The adaptation of the flotation principle to large telescope mountings; a possible solution of the difficulties encountered in mounting great equatorial instruments; (2) the registration of star-transits by photography; (3) a new form of dipteroscope; (4) a new surveying instrument for the rapid measurement of horizontal and vertical angles; (5) a new form of position-finder for adaptation to ships' compasses.—Dr. G. H. **Pethybridge** exhibited and described an improved form of potometer.—Sir Howard Grubb exhibited some new forms of geodetical instruments as already described in the *Transactions* of the Royal Dublin Society in May, 1902.

PARIS.

Academy of Sciences, December 7.—M. Albert Gaudry in the chair.—Some observations relating to the action of hydrocarbon vapours on animal microbes and on insects, and on the antiseptic rôle of oxidising-oxidisable agents, by M. **Berthelot**. In an experiment described by the author, the antiseptic properties usually ascribed to naphthalene were found to be non-existent. There would appear to be a relation between the oxidising power of a body and its antiseptic power.—On the electromotive forces resulting from the contact and the reciprocal action of liquids, by M. **Berthelot**.—On a new Protozoa, *Piroplasma Donovanii*, the parasite of an Indian fever, by MM. A. **Laveran** and F. **Mesnil**. A description of a parasite isolated from a case of fever arising at Dum-Dum, near Calcutta. There appears to be no essential difference between this parasite and the *Piroplasma* already known, in particular, the type *P. bigeminum*. This genus of parasites occupies an important place in veterinary pathology, but this is the first time that a human disease has been traced to it.—On the property of emitting the *n*-rays conferred by compression on certain bodies, and on the spontaneous emission of the *n*-rays by tempered steel, tempered glass, and other bodies in a state of constrained molecular equilibrium, by M. R. **Blondlot**. Numerous substances have been found to give off *n*-rays during compression, recognisable by their action on feebly illuminated phosphorescent calcium sulphide. Substances such as tempered steel and glass, permanently under strain, appear to give off these rays indefinitely.—Observations on the Leonids and Bielids made at Athens during 1903, by M. D. **Eginitis**.—On a theorem on measurable ensembles, by M. Émile **Borel**.—Generalisation of a theorem of Laguerre, by M. A. **Auric**.—On the quality of helices used in aërostats, by M. Charles **Renard**.—On the intensity of the light produced by the sun, by M. Charles **Fabry**. The conclusion is drawn from the experiments described that the illuminating power of the sun at the zenith, at its mean distance, is, at the level of the sea, 100,000 candles.—On the direction of permanent magnetisation in certain volcanic rocks, by MM. Bernard **Brunhes** and Pierre **David**.—The effect of time in the comparison of the luminous intensity of coloured lights, by MM. André **Broca** and D. **Sulzer**. If two lights of different colours are compared in a photometer, the equality is affected by the time during which the disc is exposed to the light. The effects are due to differences in the retinal fatigue for the different colours.—On a new mode of calculating the heats of combustion of organic compounds, and on some of its consequences, by M. P. **Lemoult**.—Researches on azo-compounds. A new mode of formation of the indazylic derivatives, by M. P. **Freundler**.—The action of hydro-

cyanic acid upon aldehyde-ammonia and analogous compounds, by M. Marcel **Delépine**. The results of the experiments described show that the ordinary equations for expressing this reaction require some modification.—A new reaction of hydroxylamine, by M. L. J. **Simon**.—A new method for the preparation of aldehydes, by M. L. **Bouveault**. Disubstituted formaldehydes of the type $H.CO.NR.R'$ react with magnesium alkyl derivatives to form compounds which, on subsequent treatment with water and dilute sulphuric acid, yield aldehydes. The yields are good, and the method would appear to be of general application.—On the migration of the phenyl group, by M. Marc **Tiffeneau**.—On the esters of isopyromucic acid, by M. G. **Chavanne**. The methyl and ethyl esters of pyromucic acid cannot be obtained by the usual methods, but can be readily isolated by the use of ethyl and methyl sulphates.—On the hydrates of ethyl alcohol, by MM. E. **Varenne** and L. **Godefroy**. From the determination of the viscosity of alcohol-water mixtures, the existence of five hydrates of the alcohol is inferred.—The production and distribution of some organic substances in *Citrus madurensis*, by MM. Eug. **Charabot** and G. **Laloue**.—On the chemical characters of wine arising from vines which are attacked by mildew, by M. Emile **Manceau**. Such wines are distinguished from ordinary wines by several chemical differences, the most important being the increased proportion of albumenoid matters.—On the determination of the primitive form of crystals, by M. F. **Wallerant**.—The revision of the free marine Nematods of the region of Certe, by M. Etienne **de Rouville**.—A parasitic sporozoa of the mussel and other Lamellibranchs, by M. Louis **Léger**.—On the filosity of potatoes, by M. G. **Delacroix**. A study of the cause of the tendency to develop buds which lengthen considerably and remain thin.—On the Permian system in the French and Spanish Pyrenees, by M. J. **Caralp**.—Observations relating to the Tectonic in the mountain valley of Jalomita, Roumania, by M. J. **Bergeron**.

NEW SOUTH WALES.

Linnean Society, September 30.—Mr. Henry Deane, vice-president, in the chair.—The botany of Norfolk Island, by Mr. J. H. **Maiden**. No new species is described, but 45 Phanerogams (Dicotyledons 24, Monocotyledons 21) and 17 Cryptogams (ferns 6, lichens 10, fungus 1) are recorded for the first time as indigenous to the island. Of the Algæ gathered from the shores, all (with one exception) are new records for this particular locality. The paper contains a careful list of introduced plants. Section ii. of the paper deals with early general accounts of the vegetation, bibliography, Ferdinand Bauer and Norfolk Island, early Government gardens on the island, and Phillip Island. An almost complete collection of the Norfolk Island flora is now in the National Herbarium, Sydney.—The slime of *Dematium pullulans*, De Bary, by Dr. R. Greig **Smith**. A race of *Dematium pullulans* was found with *Bact. acaciae* in the gum-flux of the peach and almond. From cultures upon solid and in fluid media a slime was obtained, which proved to be a pararabin.—The physical geography of the Blue Mountains and the Sydney district, by Mr. E. C. **Andrews**. Repeated elevation of subaerially carved and successively formed plains or almost plains (peneplains) is the key to the history of the Blue Mountain and Sydney areas in late geological time. These plains, developed near sea-level, were successively raised to heights of 700–3000 feet above the same base. The elevations imposed a dome-shaped surface upon the area, the axis of the dome being drawn out in a meridional direction. The growth of the present rivers shows the revival of stream activities after a late Tertiary uplift, when the cycle of erosion immediately preceding the present one had advanced to the stage of completion.

October 28.—Prof. T. W. Edgeworth David, F.R.S., vice-president, in the chair.—The geology of the Glass House Mountains and district, Queensland, by Harald I. **Jensen**.—On a new species of *Callitris* from New South Wales, by R. T. **Baker**. This pine attains a height of about 20–30 feet, and a diameter of from 1–2 feet. The branchlets are slender, with a drooping habit, giving it a facies different from the other Australian species; the

fruit cones are almost identical with those of *C. Muelleri*, whilst the terete branchlets are similar to those of *C. robusta*, R.Br. It appears to be a very local species, for after a botanical survey of the pines of this State it has so far never been found except on the top of the Gowrie Ranges, north of Rylstone. The name *C. gracilis* is proposed for it in reference to the slender branchlets.—The effect of the Bassian Isthmus upon the existing marine fauna: a study in ancient geography, by C. **Hedley**. The union of Tasmania and Australia has been exhaustively dealt with by Mr. A. W. Howitt, and Prof. Spencer has shown how Tasmanian animals entered Victoria by this vanished land-bridge. The present memoir discusses the barrier such an isthmus would oppose to migration of the marine fauna.—The gum and byproducts of *Bacterium sacchari*, by Dr. R. Greig **Smith**. The gum has been identified as a galactan. The byproducts in the fermentation of saccharose are carbon dioxide, ethyl alcohol, succinic, lauric, palmitic, acetic and formic acids.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 17.

LINNEAN SOCIETY, at 8.—On the *Dicoglossa*; a Study in Evolution: H. J. Fleure.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The City and South London Railway; Working Results of the Three Wire System applied to Traction: P. V. McMahon.

FRIDAY, DECEMBER 18.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—An Inquiry into the Working of various Water-Softeners: C. E. Stromeyer and W. B. Baron.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Action of the Sea upon the Foreshore: C. B. Case.—The Causes of the Loss of Beaches: F. W. Cable.

SATURDAY, DECEMBER 19.

ESSEX FIELD CLUB, at 6.30 (Essex Museum of Natural History, Stratford).—Report on Protection of Birds in Essex: F. Dent.—Some Pictures of Bird Life at Home and Abroad: R. B. Lodge.

MONDAY, DECEMBER 21.

INSTITUTE OF ACTUARIES, at 5.—The Income Tax as affecting Life Offices, with Special Reference to some Recent Decisions: J. E. Faulks.

TUESDAY, DECEMBER 22.

INSTITUTION OF CIVIL ENGINEERS, at 8.—On the Resistance of Plane Surfaces in a Uniform Current of Air: Dr. T. E. Stanton.

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